Mean and Standard Deviation of a Binomial Distribution

A certain surgical procedure has an 85% chance of success. A doctor performs the procedure on eight patients. Find the mean and standard deviation for the number of successful surgical procedures.

$n = 8$ $p = .85$ $q = .15$

For a Binomial Probability Distribution-

Mean: $\mu = n \cdot p$

Standard Deviation: $\sigma = \sqrt{n \cdot p \cdot q}$

Find the mean and standard deviation for the problem above.

$\mu = 8 \cdot 0.85 = 6.8$

$\sigma = \sqrt{8 \cdot 0.85 \cdot 0.15} = 1.01$

Interpretation: Range Rule of Thumb:

Maximum usual value: $\mu + 2\sigma$ $6.8 + 2(1.01) = 8.8$
Minimum usual value: $\mu - 2\sigma$ $6.8 - 2(1.01) = 4.8$

In the problem above:

a.) Is it unusual for there to only be 3 successful surgery's when this procedure is used?

yes, more than 2 σ

b.) Is it unusual for there to be 8 successful surgery's when this procedure is used?

No, less than 2 σ

Example: Several statistics students are unprepared for a surprise true/false test with 16 questions, and all of their answers are guesses.

$n = 16$ $p = .5$ $q = .5$

a.) Find the mean and standard deviation for the number of correct answers for such students.

$(16)(.5) = 8$ $\sqrt{(16)(.5)(.5)} = 2$

b.) Would it be unusual for a student to pass by guessing and getting at least 10 correct answers?

$8 - 2(2) = 4$
$8 + 2(2) = 12$ No

Example: The results of a recent survey indicate that 58% of households in the United States own a gas grill. If you randomly select 100 households to survey.

$n = 100$ $p = .58$ $q = .42$

a.) Find the mean and standard deviation for the number of correct answer for such students.

$(100)(.58) = 58$ $\sqrt{(100)(.58)(.42)} = 4.9$

b. Would it be unusual for 70 of the 100 households to have a gas grill?

$58 - 2(4.9) = 48.2$
$58 + 2(4.9) = 67.8$ yes